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Final Technical Report
For NASA Grant NAG-5-2214
Orbital Period Changes in the Low Mass X-ray
Binary EXO 0748-676

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This report describes the activities at Penn State University supported by NASA Grant NAG-5-2214, "Orbital Period Changes in the Low Mass X-ray Binary EXO 0748-676". Initiated at Penn State in Mar., 1993, the aim of this investigation was to accurately measure the eclipse times of EXO 0748-676 in order to investigate whether an apparent sinusoidal modulation of the eclipse times was a permanent feature of the system and, if so, whether this could be interpreted as a triple system.

ROSAT observed EXO 0748-676 twice. However, in spite of the fact that we provided an accurate ephemeris on neither occasion was EXO 0748-676 observed at the correct time. This thus prevented the data from being used for their intended purpose. We were, however, able to use ASCA performance verification phase data to undertake our intended scientific goal and this was published as:

"Is the changing orbital period of EXO 0748-676 evidence for a triple system?", R.H.D. Corbet, K. Asai, T. Dotani, & F. Nagase, 1994, *Astrophys. J.*, 436, L15.

In addition, the second ROSAT observation was arranged to be simultaneous with an ASCA observation. The ASCA data indicate the presence of a soft excess which is interpreted as line emission from a relatively low temperature plasma - possibly the accretion disk corona as the soft excess becomes more prominent during dips in the light curve. The low energy response of the ROSAT data thus provide an additional handle on the soft excess and, in addition, help to calibrate the low-energy response of ASCA.

In October, 1994, Dr. Corbet left Penn State to take charge of the Science Operations Facility for the XTE satellite at Goddard. Dr. Corbet continued scientific leadership of this effort, but programmatic matters have been handled by Dr. John Nousek. The remaining funds have been spent on support of Mr. Brian Thomas, Penn State graduate student.

Mr. Thomas has continued working on the soft excess of EXO 0748-676 as a principal component of his Ph.D. thesis. This work is being directed in detail by Dr. Corbet, with Dr. Nousek as the chair of Mr. Thomas's thesis committee.

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